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10/733,012	12/10/2003	Christopher L. Coleman	10021079-1	7522
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Kathy Manke			EXAMINER	
Avago Technologies Limited			CURS, NATHAN M	
4380 Ziegler Road				
Fort Collins, CO 80525			ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/733,012

Applicant(s)

COLEMAN, CHRISTOPHER L.

Examiner

Nathan Curs

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6, 8-15, 17 and 18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8-15, 17 and 18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 December 2003 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

1. Claims 1-18 are objected to because of the following informalities:

In claim 1-18, there is inconsistent and confusing numbering of recited elements. For example, claim 1 recites "a first module, comprising: a first die... of light sources" and "a second module comprising: a second die... of detectors". Here, the "second die" means the second die *overall*, even though it's the first die recited for the second module. However, claim 5 recites "the first module further comprises: a second die... of detectors". Here, the "second die" simply means the second die *of the first module*, not overall. Then, claim 12 recites "the second module further comprises: a third die... of light sources". Here, the "third die" of the second module is the third die *overall*. The numbering of recited elements should be consistent.

In claim 11, line 1, "claim I" should be "claim 1".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1, 2, 4, 10, 13 and 15 are rejected under 35 U.S.C. 102(a) as being anticipated by Stone (US Patent No. 6635861).

Regarding claim 1, Stone discloses a free-space parallel optical interconnect, comprising: a first module, comprising: a first die comprising an array of light sources, each light

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source emitting light (fig. 12, element 10 and col. 9, line 53 to col. 10, line 5 and col. 6, line 50 to col. 7, line 8); and a first common collimating lens for receiving the light directly from each light source and for directing the light from each light source to a second module (fig. 12, element 200 and col. 9, line 53 to col. 10, line 5 and col. 7, lines 9-23); and the second module comprising: a second die comprising an array of detectors (fig. 12, element 14); and a second common collimating lens for directing the light from the light sources directly to corresponding detectors in the array of detectors (fig. 12, element 202).

Regarding claim 2, Stone discloses the interconnect of claim 1, wherein the array of light sources is selected from the group consisting of an array of vertical cavity surface-emitting lasers (VCSELs), an array of edge-emitting lasers, and an array of light emitting diodes (LEDs) (col. 6, line 50 to col. 7, line 8).

Regarding claim 4, Stone discloses the interconnect of claim 1, wherein: the first die further comprises another array of detectors and the first common collimating lens further directs light from the second module to said another array of detectors (fig. 12, elements 10 and 200 and col. 8, lines 22-26).

Regarding claim 10, Stone discloses the interconnect of claim 1, wherein: the second die further comprises another array of light sources, each light source emitting light and the second common collimating lens further directs the light from said another array of light sources to the first module (fig. 12, elements 202 and 14 and col. 8, lines 22-26).

Regarding claim 13, Stone discloses a method for transmitting data in parallel, comprising: emitting light from each light source in an array of light sources in a first module, wherein the light from each light source carries data (fig. 12, element 10 and col. 9, line 53 to col. 10, line 5 and col. 6, line 50 to col. 7, line 8); receiving the light from each light source directly in a first common collimating lens and directing the light from each light source with a

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the first common collimating lens to a second module (fig. 12, element 200 and col. 9, line 53 to col. 10, line 5 and col. 7, lines 9-23); and directing the light from the light sources with a second common collimating lens directly to corresponding detectors in an array of detectors in the second module (fig. 12, elements 202 and 14).

Regarding claim 15, Stone discloses the method of claim 13, further comprising: directing light from the second module with the first common collimating lens to another array of detectors in the first module (fig. 12, elements 10 and 200 and col. 8, lines 22-26).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 3, 5, 6, 9, 11, 12, 14, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stone (US Patent No. 6635861).

Regarding claim 3, Stone discloses the interconnect of claim 1, but does not explicitly disclose that the light sources are spaced apart by 50 microns. However, Stone discloses high-density rectangular packing of elements at 62.5 micron pitch and then discloses achieving even higher density packing of light sources using hexagonal packing (col. 8, lines 10-22). It would have been obvious to one of ordinary skill in the art at the time of the invention to space the light sources by 50 microns using hexagonal packing, to provide the advantage of higher density spacing than rectangular 62.5 micron packing, as described by Stone.

Regarding claim 5, Stone discloses the interconnect of claim 1, and discloses a die of emitters or detectors (fig. 12, element 10 and col. 6, line 60 to col. 7, line 8 and col. 9, line 53 to

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col. 10, line 5) and also discloses bidirectional communication with emitters and detectors on the same die (col. 8, lines 22-26), and also discloses variable die size (col. 6, lines 15-20), but does not disclose that the first module further comprises: a second die comprising another array of detectors and the first common collimating lens further directs light from the second module to said another array of detectors. However, based on the disclosure of manufacturing a die of just emitters, a die of just detectors, or a die of mixed emitter and detectors, and based on the disclosure of variable die size, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute a full-size die of mixed emitters and detectors with a pairing of a half-size die of emitters and a half-size die of detectors for, since this substitution would yield predictable results to one of ordinary skill.

Regarding claim 6, Stone discloses the interconnect of claim 1, and discloses a die of emitters at one end transmitting to a die of detectors at the other end (fig. 12 and col. 9, line 53 to col. 10, line 5, transmitting from MCM 1 to MCM 2 and col. 6, line 50 to col. 7, line 8) and discloses a goal of bidirectional transmission (col. 2, lines 21-25 and col. 8, lines 22-26) but does not disclose that the first module further comprises: a second die comprising another array of detectors and a third common collimating lens for directing light from the second module to said another array of detectors. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to simply duplicate the transmission path of fig. 12, such that a second path transmits from MCM 2 to MCM 1, because using the disclosed configuration of fig. 12 in a second instance to achieve bidirectional transmission was within the capabilities of one skilled in the art.

Regarding claim 9, Stone discloses the interconnect of claim 1, but does not disclose that the detectors are spaced apart by 50 microns. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to space the detectors apart by 50 microns,

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based on the same rationale described above for claim 3 for spacing the light sources apart by 50 microns.

Regarding claim 11, Stone discloses the interconnect of claim 1, but does not disclose that the second module further comprises: a third die comprising another array of light sources, each light source emitting light; and the second common collimating lens further directs the light from said another array of light sources to the first module. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a third die comprising another array of light sources in the second module, based on the same rationale described above for claim 5 for arranging emitter and detectors for the first module.

Regarding claim 12, Stone discloses the interconnect of claim 1, but does not disclose that the second module further comprises: a third die comprising another array of light sources, each light source emitting light and a third common collimating lens for directing the light from said another array of light sources to the first module. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to duplicate the transmission path for bidirectional transmission based on the same rationale as described above for claim 6.

Regarding claim 14, Stone discloses the method of claim 13, but does not disclose directing light from the second module with a third common collimating lens to another array of detectors in the first module. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to duplicate the transmission path for bidirectional transmission based on the same rationale as described above for claim 6.

Regarding claim 17, Stone discloses the method of claim 13, but does not disclose emitting light from each light source in another array of light sources in the second module and directing the light from said another array of light sources with a third common collimating lens to the first module. However, it would have been obvious to one of ordinary skill in the art at the

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time of the invention to duplicate the transmission path for bidirectional transmission based on the same rationale as described above for claim 6.

Regarding claim 18, Stone discloses the method of claim 13, but does not disclose emitting light from each light source in another array of light sources in the second module; and directing the light from said another array of light sources with the second common collimating lens to the first module. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a third die comprising another array of light sources in the second module, based on the same rationale describe above for claim 5 for arranging emitter and detectors for the first module.

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stone (US Patent No. 6635861) in view of Pavelchek (US Patent Application Publication No. 2002/0071160).

Regarding claim 8, Stone discloses the interconnect of claim 1, but does not disclose that the array of detectors comprises an array of positive-intrinsic-negative (PIN) photodiodes. Pavelcheck discloses a free-space transceiver using PIN photodiodes for the receiver (paragraph 0054). It would have been obvious to one of ordinary skill in the art at the time of the invention to use PIN photodiodes for the photodiodes of Stone, because PIN photodiodes are less complicated to implement than other types of photodiodes, as taught by Pavelchek.

Response to Arguments

7. Applicant's arguments filed 13 June 2007, with respect to Green's collimating lens not directly receiving light from each light source, have been fully considered and are persuasive in light of the claim amendments. Therefore, the rejections based on Green have been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Stone.

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Conclusion

8. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pairedirect.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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